

Supplemental Amendment and Response

Applicant: Robert L. Battey et al.

Serial No.: 09/812,158

Filed: March 19, 2001

Docket No.: 10961158-6

Title: ELECTRICAL AND FLUIDIC INTERFACE FOR AN INK SUPPLY

Please replace the paragraph beginning at page 5, line 18, with the following rewritten paragraph:

D²
FIG. 1 shows a schematic representation of the printing system showing an ink container of the present invention which forms a fluid interconnect and an electrical interconnect with the printing system.

Please replace the paragraph beginning at page 5, line 23, with the following rewritten paragraph:

D³
FIG. 3 is an ink container receiving station of the type used in the printer of FIG. 2 shown broken away with an ink container positioned for insertion into the ink container receiving station.

Please replace the paragraph beginning at page 6, line 1, with the following rewritten paragraph:

D⁴
FIG. 5 shows the ink container of FIG. 4 shown in section taken across section line A-A' of FIG. 4a shown partially inserted into the ink container receiving station.

Please replace the paragraph beginning at page 6, line 3, with the following rewritten paragraph:

D⁵
FIG. 6 shows the ink container of FIG. 5 shown fully inserted in a latched position within the ink container receiving station.

Please replace the paragraph beginning at page 6, line 5, with the following rewritten paragraph:

D⁶
FIG. 7 shows the electrical interface between the ink container of the present invention and the ink container receiving station shown greatly enlarged.

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Please replace the paragraph beginning at page 6, line 10, with the following rewritten paragraph:

D⁷ FIG. 1 is a schematic representation which depicts an ink-jet printing system 10 that includes an ink container 12 of the present invention. The ink-jet printing system 10 also includes an ink container receiving station 14, an ink-jet printhead 16 and a print controller 18. Printing is accomplished by the ejection of ink from the printhead 16 under the control of print controller 18. The printhead 16 is connected to the controller 18 by a link 19 for controlling ejection of ink. Ink is provided to the printhead 16 by way of a fluid conduit 21 which fluidically connects the printhead 16 to the receiving station 14. The ink container 12 includes a fluid outlet 20 which is in fluid communication with a fluid reservoir 22. The ink container 12 further includes electrical contacts 24 which are electrically connected to an information storage device 26.

Please replace the paragraph beginning at page 6, line 20, with the following rewritten paragraph:

D⁸ It is the fluid outlet 20 and the electrical contacts 24 which allow the ink container 12 to reliably interconnect with a fluid inlet 28 and electrical contacts 30, respectively, associated with the ink container receiving station 14. The ink container receiving station 14 enables ink to be transferred from the fluid reservoir 22 associated with the ink container 12 to the printhead 16 via the fluid conduit 21. In addition, the ink container receiving station 14 allows the transfer of information between the information storage device 26 associated with the ink container 12 and the print controller 18 via a link 32.

Please replace the paragraph beginning at page 6, line 27, with the following rewritten paragraph:

D⁹ FIG. 2 depicts a perspective view of one embodiment of a printer 10, with its cover removed, containing one or more ink containers 12 which incorporate the plurality of electrical contacts 24 and the fluid outlet 20 of the present invention, shown in FIG. 1. The electrical contacts 24 and fluid outlet 20 of the present invention provide a very reliable fluid and electrical connection between the printer 10 and the ink container 12.

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Please replace the paragraph beginning at page 7, line 24, with the following rewritten paragraph:

D¹⁰

The present invention relates to the ink containers 12 which provide ink to the printheads 16 for ejection onto print media. The ink containers 12 are referred to as an off-axis ink supply because the ink supply is spaced from a scan axis defined by the scanning carriage 44. This off-axis ink delivery system includes an ink container receiving station 14, for receiving ink containers 12. The ink containers 12, in the case of color printing, are often separate ink containers for each color and a container for black ink. For example the ink container 12 for one preferred embodiment shown in FIG 2 is an ink container 54 for black ink, an ink container 56 for yellow ink, an ink container 58 for magenta ink, and an ink container 60 for cyan ink. The receiving station 14 contains a mechanical interface, a fluid interface, and an electrical interface so that when the proper ink container 12 is inserted into the receiving station 14 the ink container 12 is latched into place and electrical and fluidic interfaces are accomplished with the printer 10. Ink passes through these fluid interfaces in the receiving station 14 through a fluid conduit 21 such as tubing which fluidly connect the ink containers 54, 56, 58, and 60 with corresponding printheads 16 on the print scanning carriage 44.

Please replace the paragraph beginning at page 9, line 4, with the following rewritten paragraph:

D¹¹

Insertion of the ink container 12 into the receiving station 14 forms both an electrical interconnect and a fluid interconnect between the ink container 12 and the receiving station 14 which is the subject of the present invention. Electrical contacts 24 associated with the ink container 12 engage corresponding electrical contacts 30 associated with the receiving station 14 to allow information to be transferred between the receiving station 14 and the ink container 12. It is the positioning of these electrical contacts 24 on the ink container 12 that allows a highly reliable electrical contact to be formed between the receiving station 14 and the ink container 12.

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Please replace the paragraph beginning at page 9, line 12, with the following rewritten paragraph:

D12
FIGS. 4a, 4b, and 4c depict isometric views of one preferred ink container 12 of the present invention. The ink container 12 includes an outer surface or housing 72 having a leading edge 74 and a trailing edge 76 relative to the direction of insertion of the ink container 12 into the receiving station 14. The outer surface 72 has an inner surface 78 which defines a cavity 80. The outer surface 72 defines an opening 82 into the cavity 80 at the leading edge 74 of the ink container 12. In the preferred embodiment the outer surface 72 of the ink container 12 has beveled edges 84 which at least partially surround the opening 82.

Please replace the paragraph beginning at page 10, line 9, with the following rewritten paragraph:

D13
FIG. 5 depicts the ink container 12 of the present invention partially inserted into the ink container receiving station 14 shown broken away. The ink container 12 includes the ink reservoir 22 which is in fluid communication with the fluid outlet 20. Also included in the ink container 12 is electrical contacts 24 which are electrically connected to the storage device 26.

Please replace the paragraph beginning at page 10, line 20, with the following rewritten paragraph:

D14
In this preferred embodiment the fluid inlet 28 on the ink container receiving station 14 includes a housing 104 and upwardly extending needle 106 having a closed, blunt upper end, a blind bore 108 and a lateral hole 110. The blind bore 108 is fluidly connected to the lateral hole 110. The lower end of the needle 106 is connected to the fluid conduit 21 for providing ink to the printhead 16 shown in FIG. 1. A sliding collar 112 surrounds the needle 106 and is biased upwardly by spring 114, the sliding collar 112 has a compliant sealing portion with an exposed upper surface and an inner surface in direct contact with the needle 106.

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Please replace the paragraph beginning at page 11, line 22, with the following rewritten paragraph:

D¹⁵

Once the ink cartridge 12 is in the installed position engagement portions or leaf springs 68 engage the latching portion 64 on the ink container 12 to firmly hold the ink container 12 in place. Throughout the installation process and in the installed position, the guiding features 62 on the ink container 12 are captured in vertical channels 66 which provide lateral support and stability to the ink container 12 during insertion. It is important that the aligning features 62 on the ink container 12 and the corresponding aligning channels 66 on the ink container receiving station 14 have tight enough tolerances such that the fluid outlet 20 properly locates the ink inlet 28 on the receiving station 14.

Please replace the paragraph beginning at page 12, line 13, with the following rewritten paragraph:

D¹⁶

FIG. 7 depicts a greatly enlarged perspective view, shown partially broken away, of the ink container 12 positioned for insertion onto the electrical contacts 30 associated with the ink container receiving station 14. The cavity 80 that is positioned at the leading edge 74 of the ink container 12 is represented by dotted lines. Also shown in dotted lines is the substrate 116, electrical contacts 24, and memory device 26, each of which are positioned within the cavity 80.

Please replace the paragraph beginning at page 12, line 19, with the following rewritten paragraph:

D¹⁷

The electrical contacts 30 associated with the receiving station 14 are mounted on the electrical connector 118. The electrical connector 118 has a tapered leading edge portion 120 which engages the beveled opening 84 on the leading edge 74 of the ink container 12 to guide the electrical connector 118 into the cavity 80. The electrical connector 118 has the electrical contacts 30 spring biased outwardly from the electrical connector 118. As the ink container 12 is inserted into the receiving station 14 the electrical contacts 30 are compressed to bias against the electrical contacts 24 on the inner wall of the cavity 80 to form a low resistance electrical connection between the receiving station 14 of the printer 10 and electrical contacts 24 which are electrically connected to the memory 26. The electrical contacts 30 are each

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D17
cont. electrically connected to a plurality of electrical terminals 122 which are electrically connected to the printer 10.

Please replace the paragraph beginning at page 13, line 15, with the following rewritten paragraph:

D18
Insertion of the ink container 12 into the ink container receiving station 14 involves the alignment of the fluid outlet 20 with the fluid inlet 28. Once the fluid outlet 20 and fluid inlet 28 are in alignment, the electrical interconnection between electrical contacts 30 associated with the receiving station 14 and electrical contacts 24 associated with the ink container 12 do not disrupt this alignment. This alignment is maintained because alignment of the electrical connector 118 is accomplished by the positioning of the electrical connector 118 relative to the ink container receiving station 14 and not a change of position of the ink container 12 relative to the ink container receiving station 14. Because the electrical connector 118 is free to move in two dimensions to properly align itself with the cavity 80 there is no loading or unbalanced force placed on the ink container 12 or the fluid outlet 20 during insertion. An unbalanced force placed on the fluid outlet 20 may result in fluid leakage in the fluid interconnect between the ink container 12 and the receiving station 14.

Please replace the paragraph beginning at page 14, line 10, with the following rewritten paragraph:

D19
It is important that there not be any significant loading or unbalanced force on the ink container 12 which results in ink leakage from the fluid outlet 20 and the fluid inlet 28. Although the spring contacts 30 exert a biasing force against the inside wall of the cavity 80, this same biasing force exerts a force on the electrical connector 118 which is equal and opposite to the biasing force on the inside wall of the cavity 80. The electrical connector 118 transmits this equal and opposite biasing force to the inside wall of the cavity 80 opposite the inside wall having the electrical contacts. Therefore, because equal and opposite forces are exerted on the ink container 12 there is no net force or loading placed on the ink container 12 by the electrical connector 118 and therefore, the reliability of the fluid outlet 20 is enhanced as well as its tendency to prevent fluid leakage.

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D²⁰

The present invention provides a reliable electrical and fluidic interconnect between the ink container 12 and the ink container receiving station 14. The positioning of both the electrical contacts 24 and fluid outlet 20 on the leading edge 74 of the ink container 12 simplifies the mechanical, fluidic and electrical interfaces between the ink container 12 and the receiving station 14. In addition, the positioning of the electrical contacts 24 in a spaced relationship from the fluid outlet 20 and within the cavity 80 on the leading edge 74 of the ink container 12 helps minimize the risk of contamination of the electrical contacts 24 either by ink which may short the electrical contacts or other forms of contamination such as the handling of the ink container 12 prior to insertion into the printer 10. Contamination due to handling on the ink container 12 can be particularly insidious because this contamination can transfer from the ink container electrical contacts 24 to the electrical contacts 30 associated with the printer 10 in which case simply replacing the ink container 12 may not remedy the problem.
